**Investigating the rate of diffusion through a membrane STUDENT**

**Introduction**

Beetroot cells contain red pigments known as ‘betalains’. The plasma membrane acts as a barrier to the diffusion of these pigments, retaining them within the cells. If the plasma membrane is disrupted, the rate at which betalains can move across it may change. You will design an investigation into how the presence of detergent affects the rate of diffusion of betalains through the plasma membrane.

**Aim**

To design and carry out an investigation into the effect of detergent on diffusion of betalains through plasma membranes.

**Intended class time**

* 2 hours

**Chemicals**

|  |  |
| --- | --- |
| Detergent | Avoid contact with eyes |

**Equipment**

* Beetroot cylinders in a beaker of water
* Ruler
* Sharp knife or razor blade
* Liquid detergent (washing up liquid)
* Test tubes or boiling tubes
* Dropping pipettes
* 5 cm3 syringes
* Colorimeter
* Cuvettes

**Health and Safety**

A lab coat should be worn for this activity. Be careful when cutting the beetroot.

**Procedure**

1. From what you know of membrane structure and the molecular nature of detergents, suggest a hypothesis for the effect of increasing detergent concentration on membrane permeability.
2. Design an experiment to test your hypothesis employing different detergent concentrations and using the colorimeter. Check your method with your teacher before embarking on step 5 below.
3. Next run some trial tests with different concentrations of detergent, observing how much betalain is released from cells. Based on these tests decide what range of detergent concentrations you will use in your investigation.
4. Make a serial dilution covering the range of detergent concentrations you have chosen.
5. Carry out your investigation, recording data appropriately.
6. Process and present your data appropriately.
7. Finally, draw a conclusion based on your results and relate it to your original hypothesis.

**Extension questions**

1. How did you decide on the range of concentrations of detergent? If you were to repeat the investigation would you change the range or the number of different concentrations used and why?
2. What variables did you need to control in your investigation and how did you achieve this?
3. What other factors could affect membrane function? Briefly describe how your investigation could be adapted to investigate one of these factors.
4. Describe the composition of cell membranes and explain the effect of detergent.

**To submit**

For this piece of work to count towards Practical Activity Group 8 of the Practical Endorsement, you need to have evidence showing your serial dilution volumes, your experimental design and your colorimeter results. You also need to have considered the above questions as the answers will aid you in preparation for your written examinations.